Siphonoglossa has been regarded as an artificial genus and treated as a clade within *Justicia* in New World Species based on morphological, chromosome and phytochemical data. This might be the same with the Old World Species. The genus *Siphonoglossa* has three described species in southern Africa, one with two varieties and there are 23 species in *Justicia*. *Siphonoglossa* is distinguished from *Justicia* by the long corolla tube (which in *S. leptantha subs. late-ovata* approaches the length and proportions of *Justicia protracta*), two or three areoles on the pollen instead of one or two rows, and the fact that the anthers do not reflex as the flowers age. This study reports the use of stylar cells as taxonomically important characters for the first time. Stylar cells closer to the stigma and stylar cells away from the stigma were studied in all *Justicia* and *Siphonoglossa* species using Herbarium specimens and Scanning Electron Microscope techniques. *Justicia* had short cells closer to the stigma and long elongate cells away from the stigma. *Siphonoglossa* only had long elongate cells except *S. linifolia*. Thecae form and corolla tube length which were previously used to justify the placement of *S. linifolia* were analysed and were observed not to be good characters. Stylar cells were found to be extremely useful in distinguishing between *Siphonoglossa* and *Justicia* and suggest that *S. linifolia* must be treated within *Justicia*. Further studies must focus on inclusion of New World species.

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Contribution of South African plants to medicinal plant biotechnology

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Plants are able to produce a wide array of secondary metabolites through intricate metabolic pathways. The ability of plants to manufacture secondary metabolites has been widely exploited by man. Reliance of human communities on plant-based remedies has a long-standing history and remains a vibrant culture interfacing with modern healthcare. Plant biotechnology can make important contributions to the natural products sector. Even so, use of this technology in Africa is limited. The potential of biotechnological applications of South African flora is discussed and several species serve to highlight the benefits of this approach. Several culture systems established in our laboratories, with particular reference to the Genus *Salvia*, are proving valuable as models to study pharmacologically-active compounds and investigate the complexities of secondary metabolism using a metabolomics approach. We have been using a multidirectional strategy in order to understand biochemical and genetic changes resulting from genetic transformation and/or plant tissue culture. Our findings on the possibilities of influencing the productivity of secondary metabolism in various culture systems are discussed.

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The response of selected C_3 and C_4 grass species to fire: Proposed experimentation and preliminary results

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C_4 grasses showed a global expansion during the late Miocene, twenty five million years after they were thought to have first appeared. Many studies have focused on what caused this global phenomenon in an attempt to understand the impact anthropogenic changes in climate might have on tropical agriculture and grassland ecosystems, both of which are of huge economic importance in Africa. It has recently been proposed that fire might have played a critical role in the observed expansion of the C_4 grasslands. C_3 and C_4 grasses occur in disturbance (fire) prone environments with C_4 grasses frequently being dominant. The aim of this study is (i) to investigate whether plant response to fire is a result of C_4 physiology or whether there is a phylogenetic component to the response and (ii) whether C_4 plants have evolved fire related characteristics that are advantageous under conditions of disturbance. Twelve grass species, six C_3 and six C_4 species, will be grown in pots and burned at the end of winter, after the frosts. The plants will be destructively harvested at three time intervals and their reallocation patterns and relative growth rates compared between species and photosynthetic type. Photosynthetic spot measurements will also be done to determine whether burning has an affect on the rate of photosynthesis. Additionally, the growth response of these species subsequent to natural fire is being monitored and preliminary results show that fire does have a differential affect on C_3 and C_4 species.

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Proteinase activity in soybean nodules

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The symbiotic association between the roots of leguminous plant and soil fixing nitrogen bacteria results in a development of specific organ called nodules, whose primary function is nitrogen fixation from atmosphere into an accessible form for plants (Ammonia). The product of symbiotic nitrogen-fixation is exported from nodules to the rest of plant, where they are incorporated into essential macromolecules that drive plant growth and development. Aging of nodules is called nodule senescence. External environmental factors e.g. (light limitation and drought) can trigger premature nodule senescence causing a decrease in quality of seeds. Senescence process is correlated with up-regulated of proteinases gene expression. Development of soybean nodules was investigated and proteinase activity was measured in nodules of different age.

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nrDNA inheritance in the African genus *Streptocarpus* and the phylogenetic implications

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As part of a phylogenetic study of *Streptocarpus* (Cape Primrose, Gesneriaceae), the pattern of variation in the position, location of the 45S nuclear ribosomal DNA (nrDNA) and its evolutionary significance have been examined. The nrDNA sites were detected by fluorescent in situ hybridisation (FISH) and these mapped onto simplified phylogenies. The data indicated that nrDNA site duplications occurred several times independently, and recently in evolutionary terms. The findings in *Streptocarpus* are compared to results obtained from several other Gesneriaceae genera, *Aeschynanthus* and *Agalmyla*. Species of *Agalmyla* analysed were uniformly diploid and possess one 45S-nrDNA locus per genome, and *Aeschynanthus* species are either diploid or tetraploid, possessing either one or two loci per genome. In contrast to *Streptocarpus*, *Aeschynanthus* nrDNA locus changes involved duplications by polyploidisation as well as intragenomic changes. Unlike in *Streptocarpus* the latter appears to have occurred early in the diversification of the genus. The relevance of this investigation to the study of evolution of nrDNA loci and to issues relating to the reconstruction of phylogenies using multicopy nrDNA gene sequences and the rate of nrDNA evolution is discussed.

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